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Reptilia, Elapidae, *Bungarus niger*: Distribution extension and first record for the state of Uttarakhand, India, with notes on snakebites in the Gori River valley

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Elapid snakes of the genus *Bungarus*, widely known as kraits, are distributed throughout the Oriental faunal region with the exception of the Philippines. Wherever they occur, these nocturnal active predators are among the most dangerous and medically important venomous snakes (Warrell 1999). Thirteen species of krait are currently recognized (Slowinski 1994; Kuch et al. 2005; Kuch and Mebs 2007). While some of these are common and wide-ranging, most krait species are actually rare in collections and have remained largely unknown both ecologically and toxicologically.

The Greater Black Krait, *Bungarus niger*, was described as a new species based on specimens from northeastern India (Dibrugarh and Sadiya in Assam, and Tindharia/Pashok near Darjeeling; Wall 1908), and is distinguished from the sympatric Lesser Black Krait, *Bungarus lividus*, by the state of its vertebral dorsal scales, which are distinctly enlarged in *B. niger* and all other species of *Bungarus*, but not or only feebly enlarged in *B. lividus*, and by a higher number of ventral and subcaudal scales (216-231 and 47-57 in *B. niger* vs. 209-221 and 35-42 in *B. lividus*; Wall 1908; 1909; 1910a; 1910b; 1924). *Bungarus niger* has since been found to be widely distributed in northeastern India (Smith 1943; Tillack and Grossmann 2001; Whitaker and Captain 2004), where it was recorded from several additional localities in West Bengal (Shaw et al. 2000), Sikkim (Wall 1924), Assam (including Cachar and Jalpaiguri districts; Wall 1908; 1910a; 1910b; Inglis et al. 1920; Grosselet et al. 2004), Meghalaya (West Garo Hills; Mathew 1992; 1995), and Arunachal Pradesh (Athreya 2005; Borang et al. 2005; Sanyal and Gayen 2006). The species is also listed for the northeastern Indian state of Nagaland (Dasgupta and Raha 2006; no voucher specimen cited). In addition, *Bungarus niger* was collected in Bhutan (Bauer and Günther 1992), western Nepal (Tillack and Grossmann 2001), and Bangladesh (Khan 2004). Vertical distribution records of *B. niger* have placed this species at elevations from 200-400 m above sea level in Bhutan (Bauer and Günther 1992) and in the district of Cachar, Assam (Grosselet et al. 2004), to 1,370-1,450 m in West Bengal (Wall 1908) and western Nepal (Naudanda, Zone Gandaki; Tillack and Grossmann 2001).

Here we report the first record of *B. niger* from the Indian state of Uttarakhand based on a specimen killed on 19 September 2005 at night by a shopkeeper who encountered the krait at the doorstep of his home at Bungapani (30°57.460' N, 80°18.248' E; 1,007 m), a very small rural marketplace in Dharchula Tehsil (district of Pithoragarh). The preserved specimen (Figures 1 and 2) was deposited in the collection of the Bombay Natural History Society (BNHS 3372). The subadult male has a snout-vent length of 560 mm and a tail length of 120 mm; smooth dorsal scales arranged in 15/15/15 rows with a vertebral row of distinctly enlarged scales; 227 ventrals; an undivided anal scale; approximately 57 undivided subcaudals (54 plus space for three scales in a

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damaged part); 7/7 supralabials, 3+4/3+4 entering orbit; 1/1 preocular; 2/2 postoculars; and 1+2/1+2 temporals. This record extends the known range of *Bungarus niger* approximately 370 km west from its previous westernmost collecting locality in Nepal (Naudanda, Zone Gandaki; Tillack and Grossmann 2001).

Founded on 9 November 2000, the state of Uttarakhand (until recently also known as state of Uttaranchal) comprises 51,125 km^2 (28°43' to 31°27' N, 77°34' to 81°02' E) of the northern regions of India that had previously been part of Uttar Pradesh state, bordering Nepal in the east, Tibet in the northeast, and the Indian state of Himachal Pradesh in the northwest (Figure 3). Its territory is largely mountainous and includes some of India's highest peaks as well as the headwaters of two of the subcontinent's great rivers, Ganga and Yamuna. Situated close to the western border of Nepal, Bungapani is located on a dry river-bed about 100 meters from the Gori River. The Gori River basin is an exceptional and biologically highly diverse landscape whose number of listed angiosperm species alone exceeds 2,190 (Mathur et al. 2003; 2005; Theophilus 2003).

This great diversity is due to extreme altitude gradients within a small surface area (over 7,400 m above sea level at Nanda Devi East to 560 m above sea level at the confluence of the Gori and Kali rivers at Jauljibi, within a basin of 120 km length and an average width of 25 km), and due to its location at the transition between the Western and the Central Himalayas and Tibet. Between the settlement where the krait was found and the river lie open fields that are among the widest in the whole Gori River valley and are used for grazing livestock. The location is riparian and sub-tropical, and the dominant forest type of the location is a transition between *Shorea robusta* and *Pinus roxburghii*.

While there are very few trees near the site where the snake was found, tree species in its vicinity comprise *Ficus religiosa* near the settlement, a few scattered *Sapium insigne* along the river-bed, and *Toona ciliata* with a host of epiphytic orchids next to the river. Trees towards the mountain slope include *Pinus roxburghii*, *Macaranga pustulata*, *Engelhardtia spicata*, *Bauhinea purpurea*, *Ficus auriculata*, *Ficus roxburghii*, *Ougenia dalbergioides*, *Boehmeria rugulosa*, and *Bombax ceiba*. The shrubs and tall herbs include *Boehmeria platyphylla*, *Pyracantha crenulata*, and *Asclepias curassavica*. The synanthropes in the vicinity include *Cassia tora*, *Urtica dioca*, and *Eupatorium* sp. (Osmaston 1927; Polunin and Stainton 1984). The other snake species caught and taxonomically confirmed within a 2 km radius of Bungapani so far are the King Cobra (*Ophiophagus hannah*), the Green Pitviper (*Cryptelytrops septentrionalis*), and two non-venomous species, *Ptyas mucosa* and *Amphiesma stolata*.

Death by snakebite is not uncommon in the area and all along the sub-tropical belt of the Gori River. Black snakes are generally believed to be venomous and feared more than others among local communities, with some recent anecdotal cases reporting people dying from snakebites within two hours. Apart from *Ophiophagus hannah* and *Bungarus niger* that are now known to inhabit this valley, the Common Krait (*Bungarus caeruleus*) has been found in the neighbouring valley west of the Gori River at a similar altitude, but its presence has not been confirmed for the Gori Basin yet. Most snakebites in the Bungapani area in the sub-tropical belt along the Gori River are caused by *Cryptelytrops septentrionalis*, so far apparently without cases of fatal envenoming. The majority of victims of *C. septentrionalis* bites are women cutting grass for livestock fodder during the post-monsoon period.

The wide geographical distribution of *Bungarus niger* along the foothills of the Himalayas and adjacent plains from the easternmost states of India to Uttarakhand in its far west, in combination with its quite extensive vertical distribution, suggests that *B. niger* may be an overlooked cause of snakebite mortality in this region of India, Nepal, and Bhutan. As it is a well-known fact that antivenom raised against the venom of a particular krait species may not be effective against that of another (Warrell et al. 1983; Chanhome et al. 1999), it remains to be demonstrated whether the polyvalent antivenoms that are produced in India (against the venoms of *Bungarus caeruleus*, *Daboia russelii*, *Echis*

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carinatus, and *Naja naja*; see also Simpson and Norris 2007) are capable of neutralizing *Bungarus niger* venom. Studies on the venom of different populations of this wide-ranging species and its medical importance in the Himalayan region of India, Nepal, and Bhutan are clearly indicated.

Figure 1. *Bungarus niger* from Bungapani, district of Pithoragarh, state of Uttarakhand, India (BNHS 3372); dorsal view. Photo by A. Captain.

Figure 2. *Bungarus niger* from Bungapani, district of Pithoragarh, state of Uttarakhand, India (BNHS 3372); ventral view. Photo by A. Captain.

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Figure 3. Map indicating the geographical position of *Bungarus niger* records in the western Himalayas. 1 (red star), new record from Bungapani, Dharchula Tehsil, district of Pithoragarh, state of Uttarakhand, India. 2 (red square), Naudanda, district of Kaski, Zone Gandaki, Nepal, previously the westernmost record of this species.

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Appendix 1

Voucher list [museum acronyms follow Leviton et al. (1985)]: BHUTAN: no locality (NMBA 22737); Phuntsholing (NMBA 22736). INDIA: West Bengal: Darjeeling (NMW 27738.2); district of Darjeeling (BMNH 1937.4.3.3); Uttarakhand: district of Pithoragarh: Bungapani (BNHS 3372). NEPAL: Zone Gandaki: district of Kaski: Naudanda (ZMB 69998).